

**Plasma Arc Torch and Method for Improved Life  
of Plasma Arc Torch Consumable Parts**

**Abstract of the Invention**

A plasma arc torch and method for improving the life of the consumable parts of the plasma arc torch, including the electrode, the tip and the shield cap . The method includes  
5     turbulating gas as it flows over the exposed surfaces of the electrode, tip and shield cap to  
increase turbulence in the hydrodynamic boundary layer of the gas flow, thereby enhancing  
convective heat transfer. The result of enhanced cooling is improved consumable parts life.  
For example, to increase the turbulence of the gas flow over the outer surface of the electrode,  
10     the plasma arc torch electrode has a roughened, or textured outer surface formed with  
dimples, axially extending grooves or spiraling grooves formed in the outer surface of the  
electrode. The inner and outer surfaces of the tip and the inner surface of the shield cap are  
similarly textured.